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Girard J. Etzkorn (1967, 2005)

PEIRCE, CHARLES SANDERS

(1839–1914)

Charles Sanders Peirce, the American philosopher, physicist, and mathematician and the founder of pragmatism, was born in Cambridge, Massachusetts. His father, Benjamin Peirce, was the leading American mathematician of the time and Perkins professor of mathematics and astronomy at Harvard. Young Charles was born and bred a scientist, and from his earliest years he showed great promise in mathematics and the physical sciences. He attended Harvard, graduated in 1859, and subsequently studied at the Lawrence Scientific School, from which he received his degree in chemistry summa cum laude in 1863.

During the next fifteen years, Peirce simultaneously pursued several distinct careers. He worked as an astronomer at the Harvard Observatory, where he did pioneer work in photometric research. He also worked as a physicist for the U.S. Coast and Geodetic Survey, of which his father was superintendent, and achieved some distinction for his discovery of hitherto undetected errors in pendulum experiments used to determine the force of gravity. And he worked, more or less privately, at philosophy and logic, steadily publishing works on these subjects from 1866 on. By 1879 he had achieved sufficient stature in these last two fields to be appointed lecturer in logic at the newly organized Johns Hopkins University in Baltimore, Maryland. He remained at Johns Hopkins from 1879 until 1884, meanwhile continuing to work for the Coast and Geodetic Survey—a connection that he sustained until 1891. In 1887, after having inherited some money, he retired to Milford, Pennsylvania, where he lived in relative isolation until his death. Peirce was twice married—in 1862 to Harriet Melusina Fay, whom he divorced in 1883, and in 1883 to Juliette Froissy, who survived him. He had no children.

PHILOSOPHICAL ORIENTATION

Peirce was a systematic philosopher of great breadth, and his writings cover almost all fields of philosophy. His greatest contributions were in the field of logic, but he wrote extensively on epistemology, scientific method, semiotics, metaphysics, cosmology, ontology, and mathematics, and less extensively on ethics, aesthetics, history, phenomenology, and religion. Since Peirce's views underwent considerable change as he grew older, it is not possible to speak of his philosophy as a single system: Rather, he formulated several systems, each of which represents a different phase in his development. These different systems, however, deal with the same problems and embody the same fundamental concept of philosophy.

Peirce came to philosophy as a student of Immanuel Kant, from whom he had acquired the architectonic theory of philosophy. In brief, this theory holds that the domain of knowledge can be so characterized that general assertions can be proven true of all possible knowledge; the theory also holds that it is the dependence of all knowledge upon logic that makes such a characterization possible. Accordingly, the doctrine holds that it is possible to derive from logic the fundamental categories and principles that form the basis of all that can ever be known. In formulating this theory, Kant assumed that logic was a completed, unchanging science. But Peirce was one of that group of men, including George Boole, Augustus De Morgan, Gottlob Frege, and others, who revolutionized logic and prepared the way for A. N. Whitehead and Bertrand Russell's *Principia Mathematica.* Hence, for Peirce, logic was a growing, changing subject, and as it changed, so, according to the architectonic theory, Peirce's philosophy had to change with it. Thus the major shifts in Peirce's system are correlated with his major discoveries in logic and reflect the modifications that he thought those discoveries entailed. In the following expo-

sition, Peirce's work will therefore be dealt with chronologically, and each system will be treated in order.

THE FIRST SYSTEM, 1859–1861

Peirce's first system is a form of extreme post-Kantian idealism. The sources of this idealism are not known: Whether he evolved it himself or derived it from some other source, such as Emersonian transcendentalism, cannot now be determined. What is clear is that by 1857 he was seeking to combine the Transcendental Analytic with Platonic idealism.

CATEGORIES. From Kant's doctrine of the Transcendental Sciences, Peirce derived a threefold ontological classification of all there is into matter (the object of cosmology), mind (the object of psychology), and God (the object of theology). Peirce referred to these three categories as the It (the sense world), the Thou (the mental world), and the I (the abstract world), respectively; and it was from these pronouns that he subsequently derived the names Firstness, Secondness, and Thirdness, by which he usually called his categories.

Having divided all there is into these three categories, Peirce's problem was then to define the relations among them. Specifically, the problem of knowledge as it appears in the first system is how the ideas in the mind of God can be known by human minds. Peirce thought he had found the solution to this problem in the Kantian principle that all phenomena and all concepts—all that can be before the mind—are representations, for he understood this to imply that the ideas in the mind of God, which Peirce conceived as Platonic archetypes, are first given a material embodiment in the form of the objects of our experience and are then derived by us from those objects by abstraction. So Peirce took the Transcendental Analytic to be a description of this process: The synthesis in intuition is the synthesis of the divine idea (already present in an unconscious form within the soul) with "the matter of sensation" to form the empirical object which is also, by virtue of the divine idea, the transcendental object; and the concept is derived by abstraction from the object given in intuition. But when it came to explaining just how the Kantian categories served to effect so un-Kantian a synthesis as that demanded by his own semiotic idealism, Peirce found himself in grave difficulties, and after struggling with the problem for some time he was forced to conclude that the Kantian table of categories was simply inadequate.

TRANSITIONAL PERIOD: STUDY OF LOGIC

According to the architectonic principle, the inadequacy of the table of categories implies the inadequacy of Kant's logical classification of propositions. In 1862, therefore, Peirce began the serious study of logic, and he naturally turned to the Scholastics for instruction. Although he began his study in the belief that the fundamental problem was the classification of propositions, he soon learned from John Duns Scotus that the classification of arguments, or forms of inference, was more fundamental, since the significance of propositions depends upon the role they play in inference. He was therefore led to investigate the irreducible forms of inference, and so to study Kant's famous paper "The Mistaken Subtlety of the Four Syllogistic Figures," in which Kant argued that all inference is reducible to Barbara or to a combination of Barbara and immediate inference. In the "Memoranda concerning the Aristotelian Syllogism," which he published in 1866, Peirce showed that Kant's argument is invalid, for the syllogism by which the reduction of the second and third figures is made is itself in the figure from which the reduction is being made. Peirce therefore concluded that the first three figures are irreducible. Moreover, Peirce noted that if the first figure is defined as the deduction of a conclusion from a major and a minor premise, then the second figure can be described as the inference of the major from the minor and conclusion and the third figure as the inference of the minor from the major and conclusion. Accordingly, Peirce held that the first figure is purely deductive, the second figure inductive, and the third figure hypothetical.

For Peirce this discovery had great importance. His previous belief in the existence of synthetic a priori propositions had rested on the two doctrines, derived from Kant, that all thought involves inference and that all inference is in Barbara. Granting these doctrines, it is clear that the major premises must be innate in the mind. But with the discovery of the role of hypothesis and induction, all synthetic propositions can be regarded as inferred, and so the problem shifts to the process of synthetic inference and to scientific inquiry.

At about the same time that he discovered the irreducibility of the three figures, Peirce made another important discovery in logic—namely, that the copula can be interpreted as the sign relation. This view, which was probably derived from the scholastic theory of supposition, enabled him to regard all propositions as instances of a single fundamental relation, and the analysis was quickly extended to inferences also by treating the

conclusion as a sign that is determined by the premises to represent the same state of affairs that they themselves represented. Such a result was thoroughly in line with Peirce's early semiotic idealism, and it meant that the fundamental logical relation from which the categories must be derived is signhood.

THE SECOND SYSTEM, 1866–1870

In 1867 Peirce published a paper titled "On a New List of Categories," in which he attempted to solve the problem of relating his three ontological categories of mind, matter, and God.

THE SIGN RELATION. Starting from Kant's position that knowledge occurs only when the manifold is reduced to the unity of a proposition, Peirce asked what that unity consisted in. Since he conceived the proposition in subject-predicate form, this is equivalent to asking how the predicate is applied to the subject. On the basis of the reduction of the copula to signhood, Peirce argued that the predicate is applied to the subject by being made to stand for the same object for which the subject stands. Thus a proposition would be impossible without reference to some object. But how does the predicate come to stand for this object? Only, Peirce held, by being interpreted as standing for it by some interpreting representation, or mind, so that no proposition is possible unless such an interpretant also exists. And how does the mind make this interpretation? Only, Peirce held, by the sign's representing its object in some respect, that is, by referring to some attribute of the object. Hence, propositions would be impossible if there were no pure abstract attributes embodied in the object to form the basis of comparison among them. So his argument, in essence, was that all synthesis involves the sign relation, that the sign relation consists in a sign standing for something to someone in some respect, and therefore that unless there are things, minds, and abstractions, there is no knowledge. But since the pure abstract attribute is the Platonic Form in the mind of God, what Peirce was really arguing is that without his three ontological categories signhood would be impossible.

Aspects of reference. In the "New List," Peirce did not present his categories directly as ontological classes; rather, he began with the problem of unifying the manifold by joining the predicate to the subject through the sign relation and then analyzed signhood into the three aspects of reference: reference to abstraction, reference to an object, and reference to an interpretant. These three aspects are then made the basis for a systematic classification of signs according to the prominence given to each reference, and this mode of classification is applied to terms, propositions, and arguments. In the case of arguments, Peirce rederived the division into hypothesis, induction, and deduction, thus presenting the three forms of syllogistic as consequences of his analysis of signs.

Logic, however, is not the only science of signs; indeed, it is but one of three, each of which studies a particular aspect of the subject. The first is speculative grammar, which studies the relation of signs to the abstraction; the second is logic, which investigates the relation of signs to their objects; and the third is speculative rhetoric, which investigates the reference of signs to their interpretants. Peirce could therefore derive his three ontological categories by abstraction from the three references of signs, but he had to show further how we can know the objects referred to and whether or not they are real. For these purposes he needed a theory of cognition and a theory of reality.

COGNITION. Peirce stated his new theories of cognition and reality in three articles published in 1868 in the *Journal of Speculative Philosophy.* These papers simply develop the implications of the "New List." Since the reference of a sign to its object is established by its being predicated of another sign which already refers to that object, and since the predication exists only because there is an interpreting sign that so interprets it, it is clear that the series of signs is doubly infinite. Peirce accepted this conclusion and asserted that there is neither a first nor a last cognition. While this doctrine appears bizarre, it has a clear purpose. What Peirce was trying to avoid was the classic dilemma of the empiricist who, having tracked cognition back to an original impression of sense, finds himself completely unable to prove the accuracy of that first impression.

Peirce held that if we examine what actually occurs in cognition, we find the process to be something like the following. In the flood of sensory stimuli that pours in upon us, we detect certain relations that lead us to segregate some stimuli and to interpret these as having a common referent. We do not know what the first such stimulus having that referent may have been, and the question is meaningless, since it is only after many stimuli have occurred that we note their relations. As experience progresses and we acquire more relevant stimuli, we further conceptualize this referent, and in time we acquire a progressively more and more complete and precise idea of it. But our knowledge is never fully complete, so that

this process of learning and inquiry is endless. It is true that once we have a relatively detailed concept of the referent, we assume that the object antedated our experience of it and in fact caused that experience; epistemologically, however, it is the experience that comes first and the notion of the object that comes later. The object, then, is a hypothesis designed to give coherence to our experience, and this hypothesis is derived by hypothetical and inductive reasoning; hence, the process of cognition can be fully described by the three forms of inference. Moreover, it follows that the object must be as we conceive it, since it is only as we conceive it that it is postulated at all, and therefore there can be no such thing as an incognizable cause of cognition, for the postulate that an object exists is warranted only by the coherence it gives to experience. Accordingly, whatever is, is cognizable.

REALITY. The above theory of cognition leads at once to a theory of reality. The object is real, Peirce held, only if as the number of cognitions goes to infinity, the concept of the object tends to a limiting form. It follows, therefore, that although the object is not independent of being thought (since it is only as it is thought that it exists at all), it is nevertheless independent of the thought of any particular man and represents what would be agreed upon by an ideal community of investigators if inquiry were to go on forever.

Many empiricists would agree with Peirce that if the object is real, then if inquiry does go on forever, our hypotheses will converge to a final true description. But few would follow him in holding that the object is real because inquiry converges. What Peirce was attempting to do in this instance was to propound a doctrine that was at once phenomenalistic and realistic. To do this, he had to give a phenomenal definition of reality that would compromise neither the inexhaustibility of the real nor the particularity of the phenomenal, and the infinite series of cognitions seemed to do just that. But could Peirce prove that the infinite series is convergent? In 1868 he thought he could do this by means of an argument that purported to show that the concept of a universe in which induction and hypothesis would not lead to agreement was self-contradictory. When he subsequently discovered that this argument was fallacious, his theory of reality had to be substantially revised.

Universals. Peirce's theory that reality consists in the convergence of inquiry led to a further consequence. For it follows that the real object must be as we conceive it to be, and since, as the "New List" showed, the predicate of a judgment is always general, it further follows that universals are real. On this basis Peirce declared himself a scholastic realist of the moderate, or Scotist, school. The claim is misleading, for whereas the scholastic doctrine rests on the assertion that the universal in the mind and the individual out of the mind have a common nature, Peirce's argument rests on the fact that no cognition is wholly determinate—that is, that there is no true individual, and that therefore everything is to some degree general. Peirce's "realism" was thoroughly idealistic throughout.

THE THIRD SYSTEM, 1870–1884

By 1870 Peirce had propounded, in outline at least, an architectonic philosophy based upon the principles that all cognition involves the sign relation; that the sign relation involves three classes of referents; and that these referents are real and can be adequately known by scientific inquiry. But this theory depended upon logical doctrines that Peirce was forced to abandon when he discovered the logic of relations.

The logic of relations. The first work on the new logic had been done by Augustus De Morgan, but little progress was made with the subject until Peirce entered the field in 1870. It was in this area that Peirce made his greatest contributions to logic, and it is no exaggeration to say that it was he who created the modern logic of relations. Philosophically these new discoveries in logic had important consequences, for the logic of relations forced Peirce to abandon the subject-predicate theory of the proposition that underlies the "New List," and so required that he overhaul his basic position. Probably the most notable revisions directly attributable to the new logic are the doctrines of pragmatism and the doubt-belief theory of inquiry.

THE DOUBT-BELIEF THEORY OF INQUIRY. Peirce formulated the doubt-belief theory in 1873, but it was first published in a series of six papers in *Popular Science Monthly* in 1877 and 1878. These papers do not constitute a rejection of the earlier theory of cognition; rather, they elaborate the earlier theory and set it in the context of biological evolution.

Any organism that is to survive, Peirce held, must develop habits of behavior that are adequate to satisfy its needs. Such habits are rules of behavior that prescribe how we should act under given conditions in order to achieve a particular experiential result. Now such habits, when thoroughly adopted, Peirce called beliefs. Since to possess beliefs is to know how to satisfy one's wants, belief is a pleasant state: Doubt, or the absence of belief, is an

unpleasant state, since one is then uncertain how to act and is unable to attain the desired goals. The organism will therefore seek to escape from doubt and to find belief. The process by which the organism goes from doubt to belief Peirce defined as inquiry. Clearly, there are various methods of inquiry, and the most satisfactory method will be that which leads most surely to the establishment of stable belief—that is, to beliefs that will stand in the long run.

PRAGMATISM. From the standpoint of the inquiring organism, a belief concerning a particular object is significant because it permits the organism to predict what experiences it will have if it acts toward the object in a given way. Recalling Kant's use of the term *pragmatic,* namely, "contingent belief, which yet forms the ground for the actual employment of means to certain actions, I entitle *pragmatic belief*" (*Critique of Pure Reason,* A 824, B 852), Peirce propounded what he called the pragmatic theory of meaning, which asserts that what the concept of an object means is simply the set of all habits involving that object. This doctrine involves a major change in Peirce's thinking, and one that is directly due to the logic of relations.

Prior to 1870, Peirce conceived the meaning of a term as the embodied abstraction that it connotes. The meaning of the concept of an object is therefore the same abstraction that is the essence of the object. But once relations were admitted as propositional constituents coordinate with quality, it became possible to conceive the object not only in terms of indwelling qualities but also in terms of relations among its states and with other objects—that is, in terms of its behavior. Accordingly, instead of regarding the behavior of the object as determined by its qualitative essence, the behavior itself may now be regarded as the essence. The meaning of the concept of an object may therefore be given by the set of laws completely specifying the behavior of the object under all conditions. These laws are conditional statements relating test conditions to phenomenal results, and such laws, considered as governing behavior, are habits relating action to experiential effects. Hence, the principle of pragmatism asserts that the concept of the object is synonymous with the set of all such conditionals. Since actual synonymy is asserted, it follows that the concept of a real object can be completely translated into phenomenal terms, but only, it should be noted, into dispositionally phenomenal terms—a point that was to cause Peirce considerable trouble.

Pragmatism: A theory of meaning. Pragmatism is Peirce's most famous philosophical doctrine, although it was made famous by William James rather than by Peirce. As Peirce defined it, pragmatism is purely a theory of meaning—not of truth. Moreover, it is a theory of meaning that combines two rather distinct emphases. First, Peirce intended pragmatism to be a principle of scientific definition. By permitting the translation of a concept into phenomenal results that are observable under stated test conditions, the principle legitimizes the use of theoretical constructs in science and thus does much to clarify the nature and status of scientific theory and proof. But when Peirce chose to call the doctrine pragmatism and insisted that the concept must be translatable into "practical effects," the choice of Kantian terminology was not accidental. Peirce was also stressing the utilitarian aspect of science and of all knowledge—that is, the fact that significance lies in the relation to ends desired. Peirce drew no distinction between these two aspects of pragmatism: For him they formed a single doctrine.

Scientific method. Taken together, pragmatism and the doubt-belief theory imply that the stable beliefs sought by inquiry are in fact the laws of science. The problem of finding the best method of inquiry therefore becomes that of the justification of scientific method, which in Peirce's terms means the justification of induction and hypothesis. Although Peirce formally presented this justification in terms of the operating characteristics of the procedures, he admitted that the relative frequency with which inductive and hypothetical inferences lead to the truth cannot be calculated; hence, our assurance that synthetic inference does ultimately lead to truth comes from the fact that inquiry will converge to a limiting result that is true by definition. Thus, in this instance Peirce admitted that the convergence of inquiry to a final opinion cannot be proven but must be assumed, and since his definition of reality rests upon the convergence of inquiry, this is equivalent to saying that the existence of the real is improvable and must be assumed. But even as an assumption the doctrine presents problems, for it amounts to saying that if inquiry were to go on forever it would converge, and thus involves fundamental questions concerning counterfactuals.

Counterfactuals. The problem of counterfactuals is central to Peirce's philosophy, and his failure to solve it was one of the chief reasons that his system of the 1870s had to be rejected. Pragmatism requires that the concept of a real object be wholly translatable into a set of conditionals relating test conditions to observations. But then it would seem that the concept of the real object is devoid

of content: That is, if the concept of the real object is synonymous with the set of conditionals, each of which is purely phenomenal, then the assertion of reality adds nothing to which a nominalist might object. Peirce, however, did not regard the concept of reality as vacuous; he argued that the conditionals are asserted to be true always, whether actually under test or not. The real, therefore, is a permanent possibility of sensation—not merely a series of sensations. But this leads directly to the counterfactual problem, or the equivalent problem of real possibility. Peirce's theory requires that there be real possible sensations—an assertion that is not only unprovable but pragmatically meaningless, since possible sensations are pragmatically equivalent to actual sensations. Thus, far from proving phenomenalism realistic, Peirce found his position reduced to a subjectivism that was the exact antithesis of the scholastic realism he had hoped to establish.

THE FOURTH SYSTEM, 1885–1914

During the years he spent at Johns Hopkins, Peirce was extremely productive in the field of logic. He further developed and extended the calculus of relations and applied it to problems in mathematics. He also clarified and revised his theory of synthetic inference, began the study of the Cantor set theory, and in 1885, with the help of his student, O. H. Mitchell, discovered quantification—a discovery in which Frege had anticipated him by six years. These new developments in logic, together with the rather serious difficulties in his own philosophical position that had become apparent by the end of the 1870s, led Peirce to attempt a radical reformulation of his position in 1885. This reformulation involved a complete revision of the categories, the theory of cognition, and the theory of reality.

THE CATEGORIES. In the 1885 version of the categories, Peirce distinguished sharply between their formal and material aspects. Formally considered, the categories (Firstness, Secondness, and Thirdness) are simply three classes of relations—monadic, dyadic, and triadic. Moreover, Peirce held that these classes are irreducible and that all higher relations (quartic, quintic, etc.) are reducible to some combination of these three. The irreducibility of monadic and dyadic relations is generally admitted. The irreducibility of triadic relations is argued on the ground that all combinatorial relations are triadic, since they involve a relation between two elements and a resulting whole. Granting this, it follows that triadic relations are irreducible, because analysis could only resolve them into components and a combinatorial relation, and that combinatorial relation would itself be triadic. But once the notions of element and combination are given, relations of more than three correlates are easily generated, and so all higher relations may be regarded as being constructed from the three basic types.

Among triadic relations Peirce distinguished pure and degenerate species. A pure triadic relation is one in which no two of the correlates would be related without the third. His example of such a relation is signhood, for the sign relates object and interpretant, the interpretant relates sign and object, and the object, by establishing the identity of the extensional domain, relates sign and interpretant. Since Peirce held that all thought is in the form of signs, it follows that all thought is irreducibly triadic, which is another way of stating the Kantian doctrine that all thought is synthetic.

Since a monadic relation is a one-place predicate, the material aspect of Firstness must be qualitative, and Peirce therefore called it quality; what he meant by this term in 1885, however, was not the embodied abstraction that he had described in 1867. Quality now refers not to a concept but to a phenomenal suchness that is the immediate, nonconceptual given of sensation. In the 1885 version, not the concept red, but that suchness of an object that leads us to classify it as red, is a quality.

Peirce called the material aspect of Secondness *haecceity,* a term derived from Duns Scotus's *haecceitas,* meaning "thisness." As experienced, haecceity is known as shock or brute resistance: Peirce described it as an immediately given, nonconceptual experience of dyadic opposition or "upagainstness." The fact that the experience implies the dynamic interaction of two things, and is therefore dyadic in structure, permits it to qualify as the material aspect of Secondness. For Duns Scotus, haecceity was the principle of individuation, and Peirce accepted this meaning: Only individual things have haecceity. It was apparently the discovery of quantification theory that led Peirce to this formulation, for in the variable of quantification theory he found a sign capable of referring directly to an object without describing it, and "thisness" was intended as that property of the object by virtue of which such a reference can be made.

The material aspect of Thirdness is less clearly defined than that of the other two categories. Peirce described it as combination, or mediation, where the latter term signifies either connection or means-ends relations among things. Signhood may also be regarded as part of the material aspect of Thirdness, and so too may generality, since the general constitutes a connection among particulars. Clearly, what Peirce was describing in

this instance has much less the character of the immediately given than is the case for the other two categories. The reason is that Peirce not only regarded all thought as triadic—he also regarded all pure triads as conceptual. The material aspect of Thirdness is therefore the experience of thought or rationality. One of Peirce's problems was to explain just how so immaterial a thing can be perceived.

COGNITION. The revision of the categories raised some important problems in regard to cognition. Not only did Peirce have the problem of demonstrating how Thirdness can be perceived, but he also had the problem of explaining how quality and haecceity could be perceived. For in his earlier writings on cognition, Peirce had explicitly denied the existence of first impressions of sense of precisely the sort that he now introduced as the material aspects of his first two categories. Moreover, a further set of problems relating to cognition arose from the doubt-belief theory itself. For in that theory, logic, both deductive and synthetic, is treated as a method whereby an inquiring organism seeks belief. The status of logic, therefore, is that of a useful but contingent means to a sought end—contingent both upon our seeking this particular end, which is a characteristic of the present evolutionary state, and upon our choosing the most efficient of the several available means. Thus, in the doubt-belief theory, logic loses that necessary relation to all possible knowledge that is asserted by the architectonic theory and required to prove the universality of the categories.

Classification of knowledge. Throughout the 1890s Peirce labored at the problem of reconstructing the architectonic theory. Since the architectonic theory presupposes a classification of knowledge into two classes—logic, and all other knowledge—Peirce's problem was to develop this classification so as to ensure the universality of the categories, while at the same time not contradicting his theory of inquiry. The final system of classification was not attained until 1902. In that system, Peirce divided knowledge into practical (or applied) and theoretical sciences, and then further subdivided the theoretical sciences into sciences of discovery and sciences of review (the latter merely summarizing the findings of the sciences of discovery). The major portion of the classification thus deals with the sciences of discovery. The classification is by presupposition.

The first science is mathematics, which Peirce regarded as presupposed by all others. Mathematics is divided into three branches: mathematics of logic, mathematics of discrete series, and mathematics of continua. It is to the mathematics of logic that Peirce assigned the threefold classification of relations that constitutes the formal aspect of the categories. Next after (and presupposing) mathematics comes philosophy, which Peirce divided into phenomenology, normative science, and metaphysics. Phenomenology, which here appeared in Peirce's writing for the first time, is defined as the study of all that can be before the mind, but in practice, it is devoted to proving that all phenomenal experience is resolvable into three factors, which are the material aspects of the three categories. Thus Peirce sought to show that his categories, in both their formal and material aspects, are presupposed by all other knowledge.

Normative science has three divisions: aesthetics, ethics, and logic. In this classification logic appears explicitly as the science of how we ought to reason in order to obtain our objectives—whatever they may be. Thus the contingent and utilitarian aspect of logic, first brought out by the doubt-belief theory, is here made central. But reasoning as we ought is only one aspect of acting as we ought, which is the proper subject of ethics: Hence, logic presupposes the science of ethics, or the science of how conduct should be regulated to attain our ends. But what our conduct ought to be depends on our aims, and these Peirce held to be the subject of aesthetics, which is the science of what is desirable in and of itself. Hence Peirce subscribed to an aesthetic theory of goodness and made the good and the beautiful coincide.

Following and presupposing philosophy is idioscopy, which Peirce subdivided into the physical and psychical sciences. Each division is further subdivided to yield what we would ordinarily regard as the physical, biological, and social sciences. All domains of science thus fall within the classification, and so depend upon the categories. The classification thus serves the purpose of preserving the architectonic while ensuring the normative role of logic.

Perception. Peirce's determination to preserve both the universality and phenomenal observability of the categories as well as the normative character of logic is evident in the theory of percepts and perceptual judgments that he propounded at this time. According to Peirce, physiology and psychology tell us that our percepts are synthesized from the myriad neural stimuli that assail us from without. Of these neural stimuli themselves and of the process of synthesis we are entirely unaware; the earliest step in cognition of which we are at all conscious is the percept. But we cannot really be said to know the percept; what we know is a perceptual judgment, which is a proposition telling us what the nonlinguistic percept was. The perceptual judgment, such as "red patch here now," is

a hypothesis that explains the percept, but it is a peculiar hypothesis, since it is immediate and indubitable. Even if the perceptual judgment is immediately followed by a contradictory perceptual judgment, still that second perceptual judgment relates to a later percept, and it remains indubitable that my first and now forever vanished percept was truly red. Perceptual judgments, therefore, form the real starting point in knowledge and must be taken as the ultimate evidence statements.

Peirce described the processes of synthesis that precede and lead to the perceptual judgment as unconscious inference. Their inferential character is defended, here as in his earlier writings, by an argument that identifies the psychological processes of association with the forms of inferences. But since these processes are unconscious, they are beyond our control and thus are not subject to logical criticism—for logical criticism, being normative, is applicable only to voluntary and controllable behavior. On the other hand, conscious inferences, such as the processes whereby we derive knowledge from the perceptual judgments, are thoroughly subject to logical criticism. Accordingly, Peirce could hold both that there is no first impression of sense and that the object (percept) is given to us by a synthesis in intuition. He could further hold that our knowledge has a definite starting point in propositions that give direct reports of phenomenal observation and that whatever is asserted in those judgments of perception must be accepted as given. Thus, in the theory of percepts and perceptual judgments, Peirce tried to reconcile his denial of first impressions with his doctrine of direct phenomenal contact with the world.

On the basis of this theory, Peirce held that the material aspects of all three categories are empirically observable. Quality and haecceity are argued to be directly observable aspects of the percept. But so, too, according to Peirce, is Thirdness, for what is asserted in the perceptual judgment is necessarily true, and the perceptual judgment, being a proposition, has a predicate that is general. Since the generality is given in the perceptual judgment, and since criticism cannot go behind the perceptual judgment, this generality must be regarded as given in perception, and hence as being observable. Thus, by phenomenological analysis, all the categories can be shown to be present in experience.

REALITY. In the course of his study of the logic of relations, Peirce noted that the analysis of certain relations leads to an infinite regress. Thus the relation "in the relation *R* to" must itself be related to its subjects by the same relation, for example, "in the relation 'in the relation *R* to' to," and so on. Such relations, which can be analyzed only into relations of the same sort, Peirce called continuous relations, since they fit the definition of the continuum as that of which every part is of the same nature as the whole. They are, according to Peirce's theory, pure triadic relations; therefore their irreducibility follows from the irreducibility of Thirdness. Moreover, since every relation must be related to its subjects by some such relation, Peirce drew the conclusion that all relations involve a continuous relation.

Continua. During the 1880s, Peirce had become acquainted with Georg Cantor's work on set theory, which bears directly on the problem of continuity. Recognizing at once the great importance of Cantor's work for both logic and mathematics, Peirce undertook the study of the foundations of mathematics and attempted to construct his own theory of cardinal and ordinal numbers. Peirce's papers on this subject are highly technical, and only the briefest summary of them can be given here. In developing his theory of cardinal numbers, Peirce discovered a form of the paradox of the greatest cardinal. His efforts to solve this paradox led him to the erroneous conclusion that the series of transfinite cardinals is only countably infinite and has an upper limit that is the power of the linear continuum. It follows that if the continuum consisted of discrete elements, then there would exist a greatest cardinal, and to avoid this conclusion he held the continuum to be a "potential" set consisting of possible points. Accordingly, although subsets of any multitude may be actualized from the continuum, nevertheless, not all of the possible points are actualizable, since if they were, we should have a greatest cardinal and hence a contradiction. Peirce believed that by such arguments he had established that whatever is truly continuous involves unactualized possibility; hence the problem of the existence of real possibility, which he had found insoluble in the 1870s, was now reduced to that of the reality of continuity. Peirce used the arguments of Zeno in an attempt to prove that space and time must be truly continuous in his (Peirce's) sense, and he went on to argue that continuous relations are truly continuous both intensively and extensively. In defining the continuum as that of which every part is the same sort as the whole, Peirce was brought to the conclusion that real relations, and so real laws, are in some sense continua.

Synechism. The doctrine that the world contains real continua Peirce called synechism. He regarded this as his most important philosophical doctrine and preferred to have his whole philosophy called by this name. He also asserted that it was a modern form of scholastic realism.

Scholastic or not, it is certainly realistic, for it holds that the external referents of true laws are real continua which, since they involve unactualized possibilities, contain real generality. To support this doctrine, Peirce had to define an ontology that would explain what those referents might be. Peirce was no stranger to such an enterprise. He began his work in philosophy in the 1850s, with the doctrine of the three ontological categories, and although he subsequently redefined the categories several times in less ontological fashion, he never forgot the question of what realities lay behind his categories. It is therefore not surprising that following the 1885 revision of the categories, Peirce returned to the problem of ontology, and this soon led him to propound an evolutionary cosmology.

EVOLUTIONARY COSMOLOGY. Peirce had several reasons for formulating an evolutionary cosmology in the 1890s. Not only did synechism require a clarification of his ontological commitments, but he was also impelled toward such a formulation by problems arising within the theory of cognition. First, the doubt-belief theory, by imbedding inquiry within an evolutionary context, made the utility of scientific method relative to a particular evolutionary adaptation, the permanence of which is by no means guaranteed and must therefore be investigated.

A second reason for Peirce's formulating an evolutionary cosmology in the 1890s springs from his doctrine of critical common sense. Like all students of scientific method, Peirce was perplexed by the problem of how we discover true hypotheses. Considering the infinity of possible false hypotheses, it is evident that not even Peirce's theory of synthetic inference could account for the remarkable frequency with which we do, in fact, find a true explanatory hypothesis. Utilizing the evolutionary doctrines current at the time (including the inheritance of acquired characteristics), Peirce argued that the human mind must possess some innate adaptation that enables us to guess the correct laws of nature more readily than pure chance would allow. Such an adaptation would mean that true hypotheses appear to us peculiarly simple and natural. According to Peirce, it follows, then, that judgments of common sense, conceived through the mechanism of the inheritance of acquired characteristics as quasi-instinctual beliefs that have been built up through centuries of experience, should have a greater probability of being true than have parvenu doctrines. But this probability is at best low, so that commonsense judgments cannot be accepted without critical analysis and careful test. Thus Peirce's doctrine of common sense is thoroughly critical: Common sense is to be regarded as a likely source of true hypotheses, but no hypothesis is to be accepted without empirical validation. But in terms of the doubt-belief theory, this doctrine leads to a serious problem. Should the course of evolution alter significantly, our innate adaptation, which has proven so useful in the past, would become positively harmful, since it would direct us to seek explanations in terms of an adaptation that no longer obtains. Accordingly, it becomes a question of considerable moment to inquire what the future course of evolution will be.

The continuous external referent. In the doubt-belief theory, Peirce had formulated the principle that a law, which he conceived as governing the behavior of an organism, is a habit. Now a habit, considered as a psychological entity, is a connection among feeling states and actions, and this connection, Peirce held, must consist in an actual substantive continuity among them. Peirce based this assertion on a variety of arguments, including the felt continuity of mental phenomena (the impossibility of memory without continuous connection between past and present) and certain arguments drawn from the behavior of protoplasm under stimulation. It was therefore Peirce's doctrine that habit, considered as a psychological entity, is a continuum corresponding to a law that is conceived as governing behavior. To find continuous external referents for all laws, Peirce asserted that the universe is itself a living organism possessed of feelings and habits and that our laws of nature describe the habits of the universe. Thus, after 1885, the subjective idealism of Peirce's early writings became an extreme form of objective idealism.

Knowledge, feeling, volition. From the position that the universe is an organism, it follows that all our experience of the external world must be describable as experience of some state or behavior of this organism. But the possible forms of experience are defined by the material aspects of the categories, while Peirce took the possible components of mind to be defined by the traditional division into knowledge, volition, and feeling. He had already identified knowledge with belief-habit and made it the correspondent of law, or Thirdness. He now identified feeling as the correspondent of Firstness and volition as the correspondent of Secondness. But the doctrine asserts more than mere correspondence, for Peirce seeks to account for the fact that all our experience can be classified by the categories, and his explanation for this fact is that what is for the cosmic organism feeling, volition, and belief is experienced by the individual as Firstness, Secondness, and Thirdness.

Chaos and order. The habits created through inquiry are, objectively viewed, laws of behavior. What then,

according to Peirce, is doubt, or the absence of belief? In the state of doubt, there will be feeling, but no habit and no order—hence, objectively viewed, the state of doubt will appear as purely random or chance behavior. Thus, objective orderliness or randomness corresponds to states of the universe in which habit is either strong or weak. The irritation of doubt is redefined as an intense consciousness associated with states of unordered feeling; as order or habit increases, the intensity of consciousness declines until, in the case in which virtually complete regularity has been established, it is so low as to be all but undetectable. Mind that is so hidebound with habit we regard as dead matter.

When the doubt-belief theory is applied to the organic universe itself, the result is an evolutionary cosmology. In the beginning, Peirce held, there is nothing but an undifferentiated continuum of pure feeling wholly without order—a primal chaos. From this starting point, the universe evolves by means of the development of habits. We have here the typical Spencerian passage from homogeneity to heterogeneity, but without benefit of Herbert Spencer's mechanical model. In the course of time, the universe becomes ever more orderly—but at any given time its habits remain less than perfectly regular and there are still areas requiring the further fixation of belief.

This cosmology is the basis for Peirce's doctrine of tychism—that there is absolute chance in the universe. For as law is the objective manifestation of habit, so chance is the objective manifestation of lack of habit; hence the primal undifferentiated continuum of feeling is literally a world of pure chance. Evolution constantly diminishes the amount of objective chance in the universe, but only in the limit does it wholly disappear. At any given time, some chance remains, and the laws of nature are not yet wholly exact.

Pragmatism and universal evolution. The doubt-belief theory describes inquiry as an attempt to escape the irritation of doubt. But it is hardly proper to say that the universe seeks to escape from doubt, and some better motive is required. The state toward which the universe is evolving is, according to Peirce's theory, one of complete order. Since such a state involves the complete subjection of feeling and action to belief, Peirce regarded it as the realization of rationality in the concrete, or, in his terms, of "concrete reasonableness." But it is also a state of maximum beauty, for Peirce's aesthetic is a coherence theory of beauty. Accordingly, the normative theory of inquiry may be brought to bear in explaining the evolutionary process. The end sought is concrete reasonableness; the means, supplied by ethics, is the regulation of conduct by this aim. In the area of inquiry, this implies the discovery of those laws necessary to regulate behavior. Thus pragmatism, or pragmaticism, as Peirce renamed his doctrine after 1905 in order to distinguish it from James's, also serves the cause of evolution, for in translating the concept into a set of habits we discover the practical effects of the object—that is, how our conduct is affected. It remains for scientific inquiry, then, to discover the truth or falsity of potential habits and hence to fix belief. Thus the course of universal evolution and our modes of inquiry must remain ever in harmony, for the objective logic of evolution is identical with the logic of discovery. All nature works by a common process to a common end, and the duty of the individual man is to aid that process by devoting himself to scientific inquiry.

See also Boole, George; Cantor, Georg; Categories; Chance; Common Sense; Counterfactuals; De Morgan, Augustus; Duns Scotus, John; Frege, Gottlob; Idealism; Induction; James, William; Kant, Immanuel; Logic, History of; Mathematics, Foundations of; Pragmatism; Realism; Russell, Bertrand Arthur William; Scientific Method; Scotism; Universals, A Historical Survey; Whitehead, Alfred North.

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Murray G. Murphey (1967)

PEIRCE, CHARLES SANDERS [ADDENDUM]

Charles Sanders Peirce, one of America's most original philosophers, produced a body of work remarkable for its scope and enduring relevance. For many years Peirce's principal contributions to mainstream philosophy were in logic and philosophy of science, but changes in the philosophic terrain since 1967 have brought new areas of his thought to prominence. The resurgence of interest in pragmatism, due in large measure to its promotion by Richard Rorty, and the adoption of Peirce by the Frankfurt School as the philosopher who may hold the key to the problem of modernity, have brought attention to Peirce's unique brand of pragmatism and to his philosophy of signs. Outside of philosophy, the active interdisciplinary field of semiotics that began in Chicago with Charles Morris acknowledges Peirce as the founder of modern sign theory.

Peirce was a late child of the enlightenment, a staunch believer in the universal applicability of mathematics and in the continuous growth of knowledge through sustained inquiry. He was a diligent student of the history of science and understood that the advancement of knowledge is crucially linked to nondeductive (inductive and abductive) reasoning and shared experimental methods. He was convinced that a prerequisite for successful experimentation is an external world resistant to actions arising from misconceptions of it. These views led Peirce to an anti-Cartesian epistemology rooted in perceptual experience and committed to fallibilism and the repudiation of deductive foundationalism. Peirce generalized his view of the advancement of science to all forms of learning from experience, and he concluded that all meaningful conceptions are necessarily related to experiential expectations (conceived consequences). This is the epistemological motivation for his meaning-focused pragmatism (pragmaticism).

Sometimes Peirce is said to have equated truth with settled belief, but that applies only when belief is settled as the result of a steadfast application of scientific method. Other methods for overcoming doubt and settling belief, such as the a priori method or the methods of tenacity and authority, while not without some advantages, do not provide grounds for confidence that truth will be reached. Even the sustained application of scientific method can never issue in a guarantee that inquiry has "stormed the citadel of truth." Truth is always relative to propositions and is, therefore, grounded in the conventionality of symbolism (for propositions can only be expressed symbolically). The true represents the real precisely insofar as inquiry forces beliefs to yield to the dictates of an independent reality, but the "correspondence" of truth and reality that is hoped for at the end of inquiry is at best an ideal limit; we can never be certain that we have reached the truth. This is Peirce's fallibilism. It is typical of Peirce's philosophy that truth and reality are correlates in a triadic relation, where the mediating relate involves a community of inquirers (interpreters).

Peirce believed that the key to intelligence of any kind is sign action (which is always goal directed), and he formulated an elaborate semiotic theory to facilitate the analysis and classification of signs. Peirce's division of signs into icons, indexes, and symbols is his best-known semiotic bequest—although his distinction between tones, tokens, and types is also widely used—but these are only two of many triads that permeate his philosophy. Peirce held that minds are sign systems and thoughts are sign actions, and it is not too far-fetched to say that the mission of his semiotic is similar to that of modern-day cognitive science. Peirce's epistemological shift from a focus on ideas to signs marks him as a forerunner, if not a founder, of philosophy's so-called linguistic turn and, also, of the modern—and postmodern—emphasis on textualism. Peirce's triadic theory of signs distinguishes